



Wind Generator

Written By: Abe Connally



TOOLS:

- [Ammeter \(1\)](#)
- [Compass \(1\)](#)
- [Crescent wrench \(1\)](#)
- [Drill \(1\)](#)
- [Flathead screwdriver \(1\)](#)
- [Jigsaw \(1\)](#)
- [Level \(1\)](#)
- [Marker \(1\)](#)
- [Metal punch \(1\)](#)
or awl
- [Pipe wrench \(1\)](#)
- [Protractor \(1\)](#)
- [Ropes \(1\)](#)
- [Shovel \(1\)](#)
- [Tape \(1\)](#)
- [Tape measure \(1\)](#)
- [Thread-tapping set \(1\)](#)
- [Vise \(1\)](#)
and/or clamp



PARTS:

- [Treadmill motor \(1\)](#)
- [Bridge rectifier \(1\)](#)
- [Copper wire \(1\)](#)
Enough length for both a red and black piece to run from the top of the tower, down through length of pole, to batteries. We recommend at least #8 wire, but if your tower will be sited a long distance away from your batteries, you may need a heavier gauge.
- [Spade connectors \(4\)](#)
for bridge rectifier
- [Heat-shrink tubing \(1\)](#)
or electrical tape
- [Battery bank \(1\)](#)
We recommend deep-cycle lead-acid storage batteries, and a total battery bank capacity of at least 200 amp-hours.
- [Regulator \(1\)](#)
or charge controller
- [Fuse \(1\)](#)

- [Wheelbarrow \(1\)](#)
- [Wire strippers \(1\)](#)

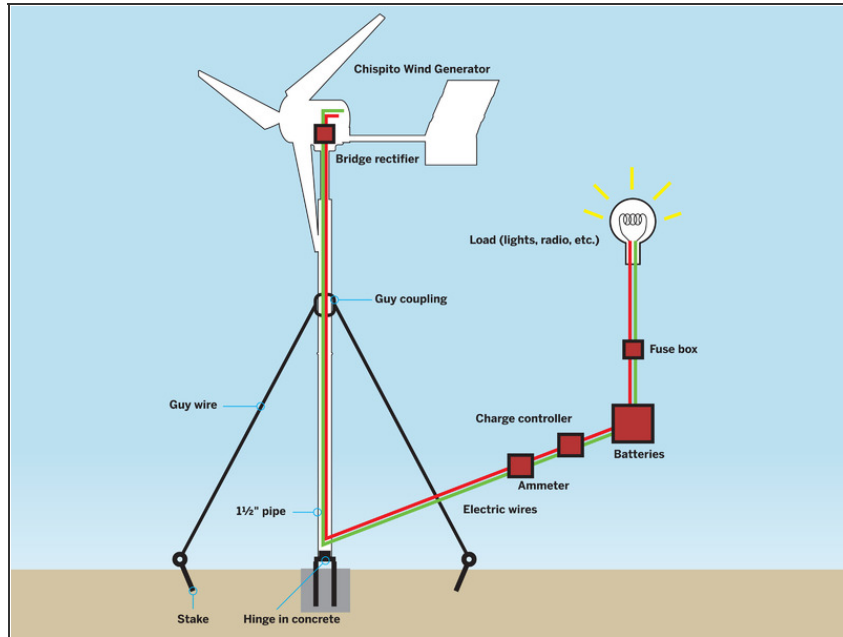
- [PVC pipe \(2' length\)](#)
[If PVC is UV-resistant, you will not need to paint it.](#)
- [Bolts \(6\)](#)
- [Washers \(9\)](#)
- [Lock washers \(6\)](#)
- [Hose clamp \(1\)](#)
- [Sheet metal \(1 sq. ft.\)](#)
- [Mounting screws \(9\)](#)
- [Metal tubing \(36"\)](#)
[or 1" angle iron](#)
- [Floor flange pipe fitting \(1\)](#)
- [Pipe nipple \(1\)](#)
- [Mounting screw \(2\)](#)
- [Hose clamps \(2\)](#)
- [Steel pipe \(1\)](#)
- [Pipe nipple \(2\)](#)
- [Pipe nipple \(1\)](#)
- [Pipe elbows \(2\)](#)
- [2](#)
- [Pipe T \(1\)](#)
- [Quick-mix concrete \(3-Feb\)](#)
- [Sheet metal screws \(4\)](#)
- [Guy wire \(1\)](#)
[with a working load of 200 pounds](#)
- [U-bolt \(1\)](#)
- [Stakes \(4\)](#)
- [Turnbuckles \(4\)](#)

SUMMARY

There are no limits to what you can do with wind power. It's abundant, clean, cheap, and easy to harness. We designed this Chispito Wind Generator (that's Spanish for "little spark") for fast and easy construction. Most of the tools and materials you need to build it can be found in your local hardware shop or junk pile. We recommend that you search your local dump or junkyards for the pieces required. Or, if you live in a city, search <http://www.freecycle.org> for salvaged parts, and see if you can install one on your roof.

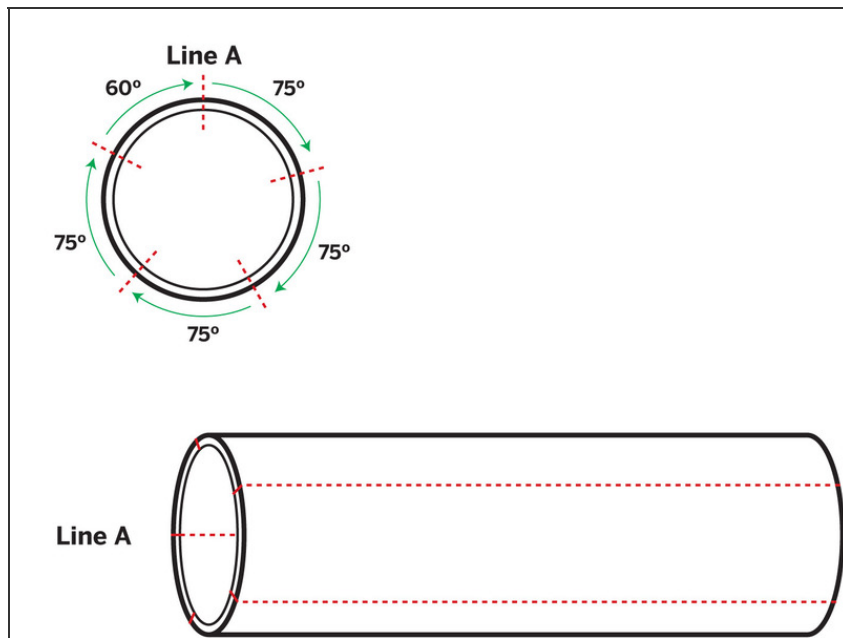
We believe that anyone can be in control of where his or her electricity comes from, and there is nothing more rewarding and empowering than making a wind-powered generator from scrap materials. Remember: puro yonke (pure junk) is best!

Step 1 — Overview



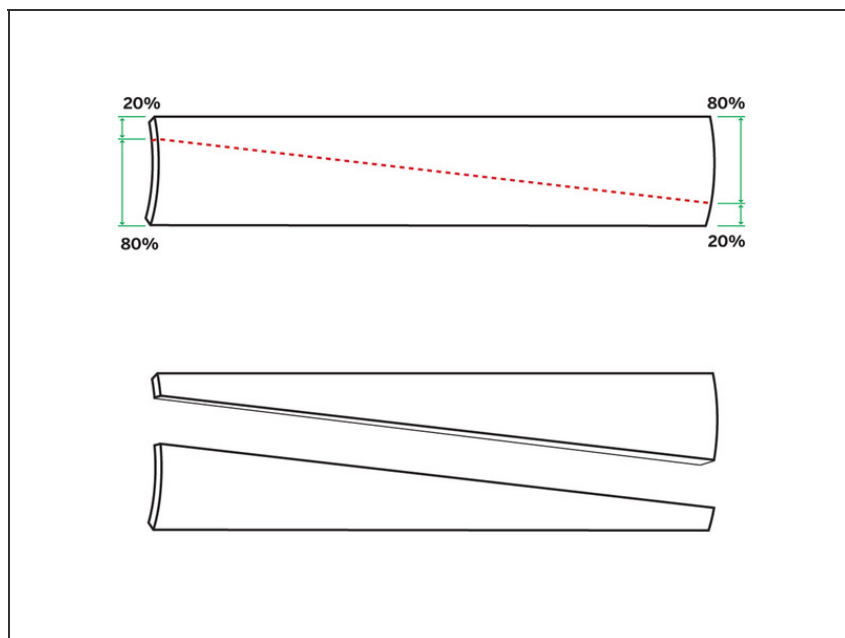
- Here is an illustration listing all the components of the wind generator that we'll be building.
- For the motor, you may use any other simple, permanent-magnet DC motor that returns at least 1V for every 25 rpm and can handle upwards of 10 amps. Our treadmill motor is rated at 5A, no load, and we've found that the coils can withstand 15A going through them without heating up.

Step 2 — Cut the blades.



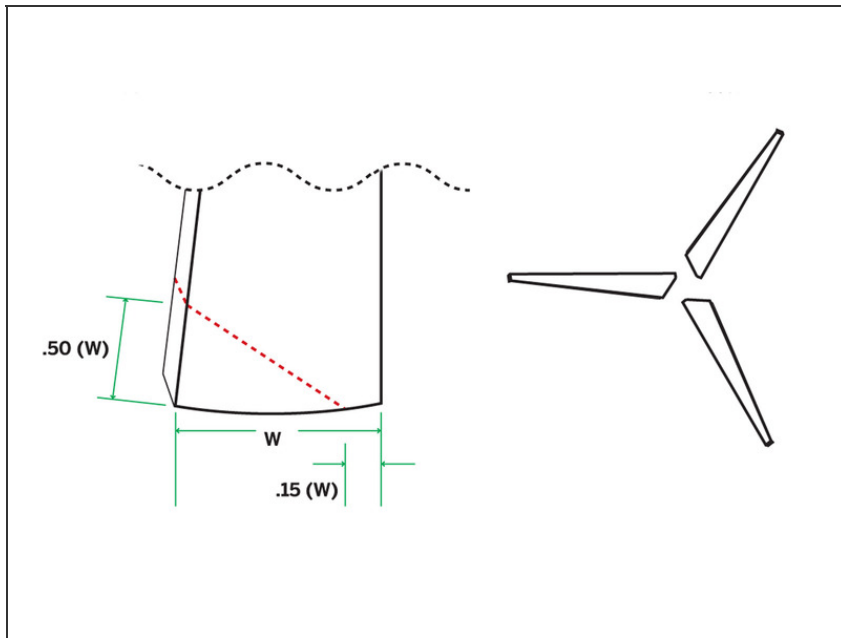
- Place the 24" length of PVC pipe and square tubing (or other straight edge) side by side on a flat surface. Push the pipe tight against the tubing and mark the line along the length of the tube. This is Line A.
- Starting from Line A, draw parallel lines at 75-degree intervals along the length of the pipe. You should have a total of five lines on your pipe as shown in figure. Note that one strip will have an arc width of only 60 degrees. That's OK.
- Use a jigsaw to cut along the lines, splitting the tube into five strips. Four will be wider than the fifth (60°) strip. Set the 60° strip aside for now.

Step 3



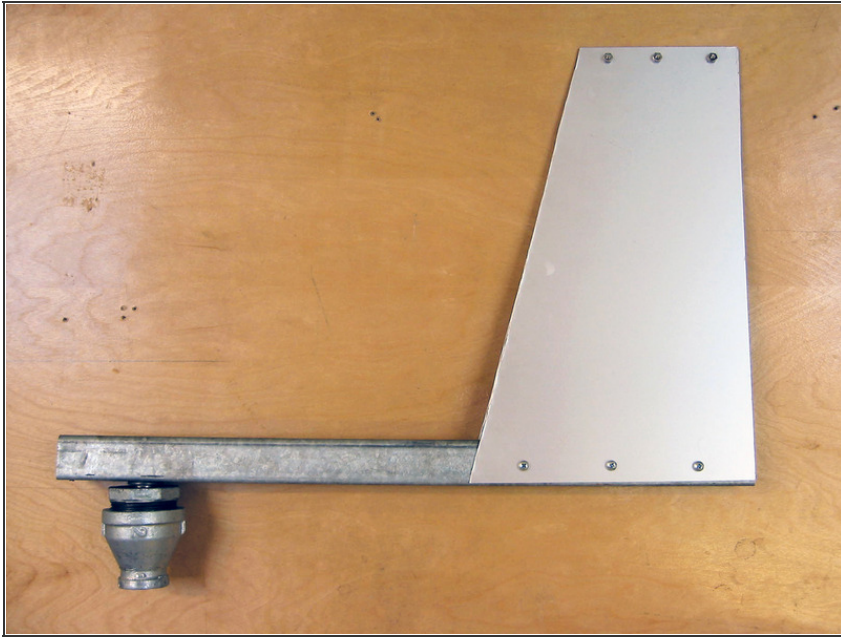
- Place the four 75° strips concave-side-down. For each one, make a mark 20% of the width of the strip from one corner along the diagonally opposite side as shown.
- Mark a diagonal line between the two marks you just made on each piece, and use the jigsaw to cut along these lines. You should wind up with eight identically shaped trapezoidal blades. You can trim a ninth blade out of the 60° strip left over. You now have enough blades for three generators, or plenty of spares for one generator.


Step 4



- Now you are going to cut one corner from each blade.
- First, measure the width of the blade (if you are using an 8" diameter PVC pipe as your stock, it should be about 5.75" wide). Call this value W .
- Then make a mark along the diagonal edge of the blade, a distance of $W/2$ from the wide end (3" is good enough if you are using 8" PVC).
- Make another mark on the wide end of the blade at 15% of W from the long straight edge (1" with 8" PVC).
- Connect these two marks and cut along the line. Removing this corner prevents the blades from interfering with each other's wind.
- The blades should look like the ones shown in the figure. Pick the three best ones of the batch.

Step 5 — Cut the tail.



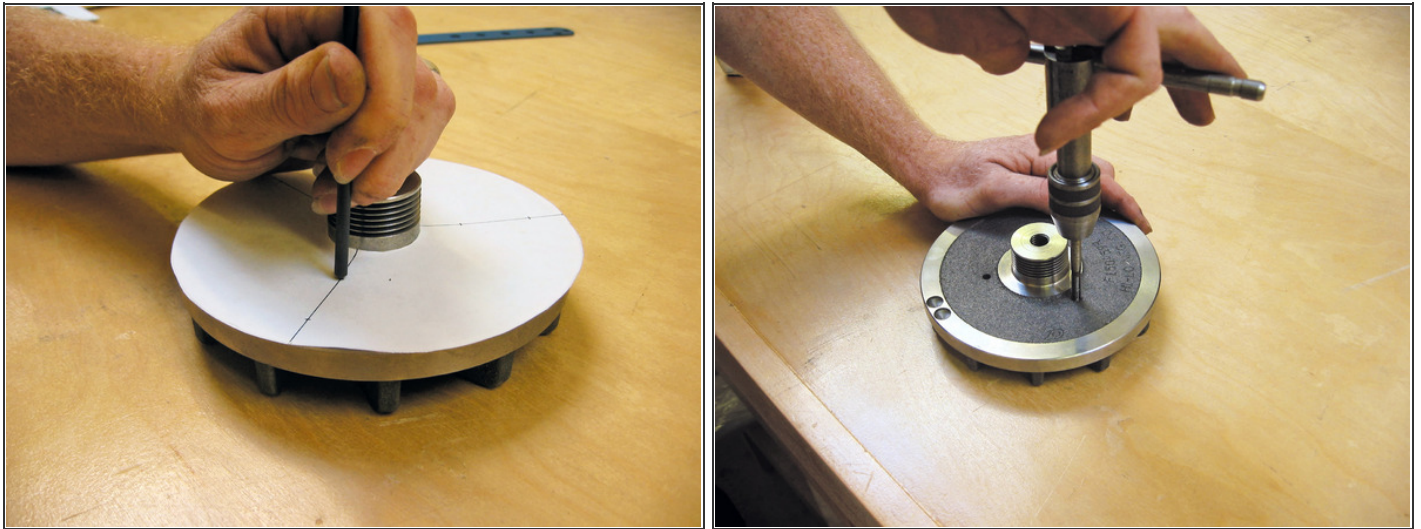
- You can make the tail any shape you want, as long as the end result is stiff rather than floppy. The exact dimensions of the tail are not important, but you'll want to use about one square foot of lightweight material, preferably metal. 
- Using the 5/32" drill bit, drill two or three holes, spaced evenly, in the front end of the tail.
- Then place the tail on one end of the square tubing, noting that it will attach to what will become either the right or left side of the tubing, as the generator sits upright.
- Mark the tubing through the tail holes.
- Drill holes in the square tubing at the marks you just made.
- Attach the tail to the tube with sheet metal screws. (Or you can do this later, so it doesn't get in the way.)

Step 6 — Attach the 3 blades.



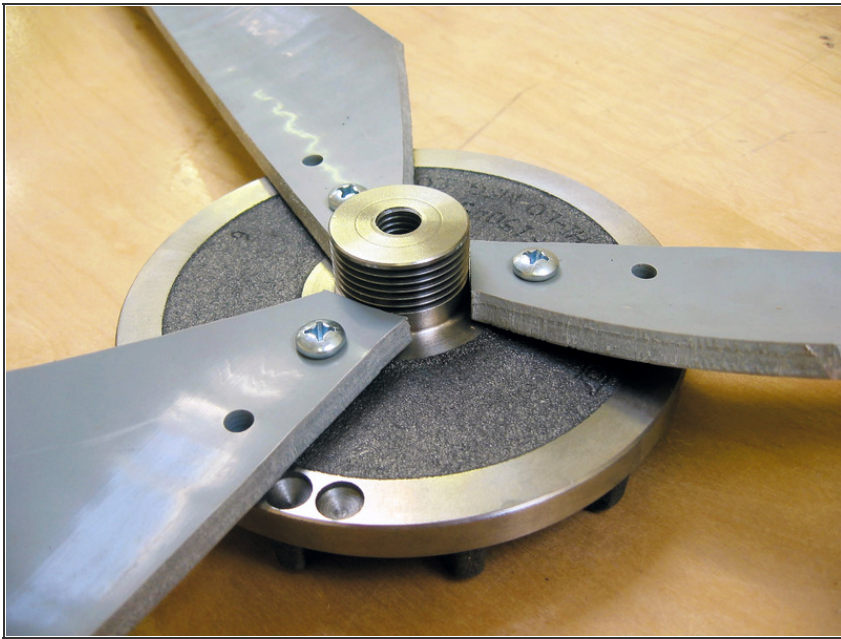
- For each blade, mark two holes along the long, right-angle side of the blade (as opposed to the long diagonal side), at the wide end, next to the cut-off corner. The first hole should be 2" from the long side and 4" from the end, and the second hole should be 2" from the straight edge and 1" from the end.
- Using the 1/4" drill bit, drill these six holes for the three blades.

Step 7



- Detach the hub from the motor shaft. With our motor, we removed the hub by holding the end of the shaft firmly with pliers and turning the hub clockwise. This hub unscrews clockwise, counter to the usual direction, which is why the blades turn counterclockwise.
- Using a compass and protractor, make a template of the hub on a piece of paper. Then mark three holes, each of which is $2 \frac{3}{8}$ " from the center of the circle, 120 degrees apart, equidistant from each other.
- Place this template over the hub and use a metal punch or awl to punch a starter hole through the paper and onto the hub at each hole.
- Drill the holes with the $\frac{7}{32}$ " drill bit, then tap them with the $\frac{1}{4}$ " tap.

Step 8



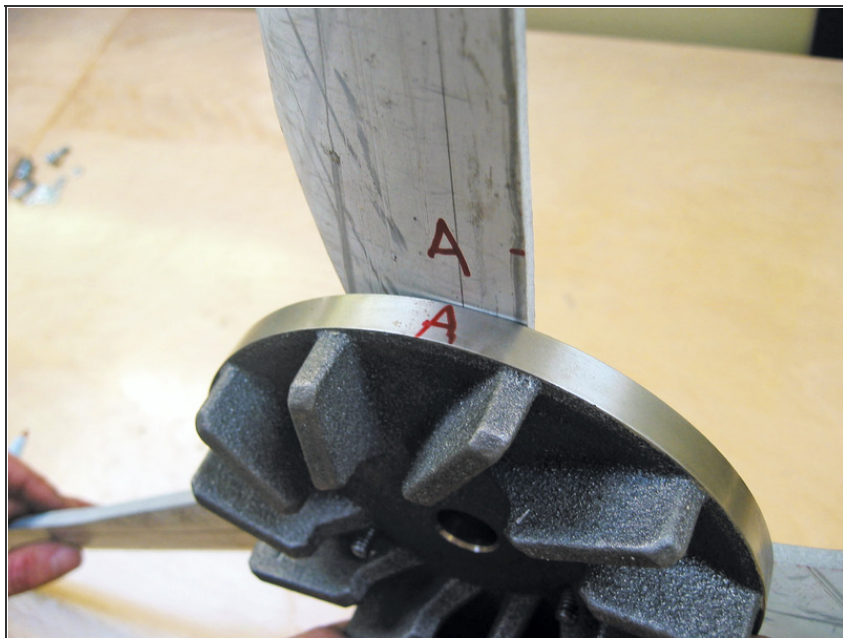
- Attach the blades to the hub using 1/4" bolts, running them through the holes closest to the ends of the blades. At this point, the three outer holes on the hub have not been drilled.

Step 9



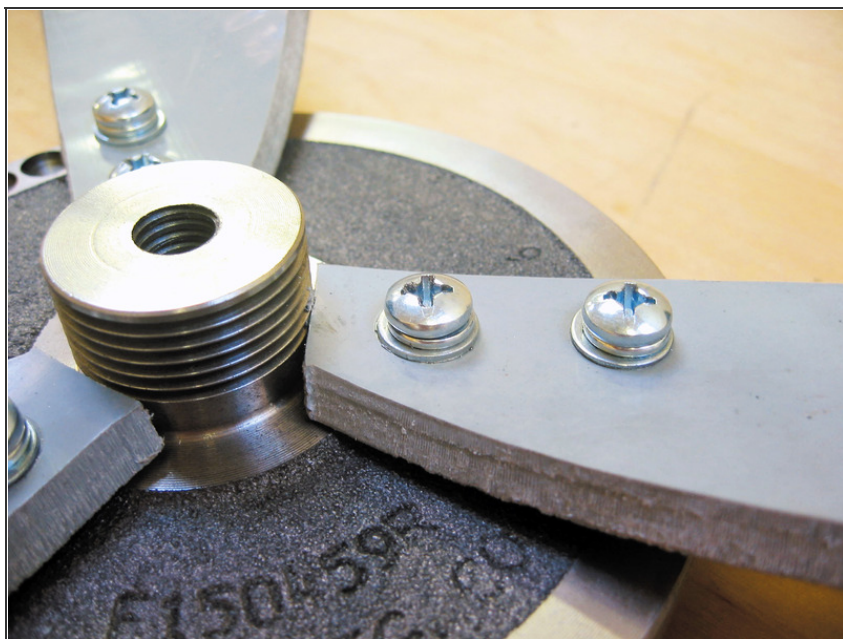
- Measure the distances between the tips of each blade, and adjust them so that they are all equidistant.
- Then mark and punch starter holes for the three outer holes on the hub through the empty holes in each blade.

Step 10



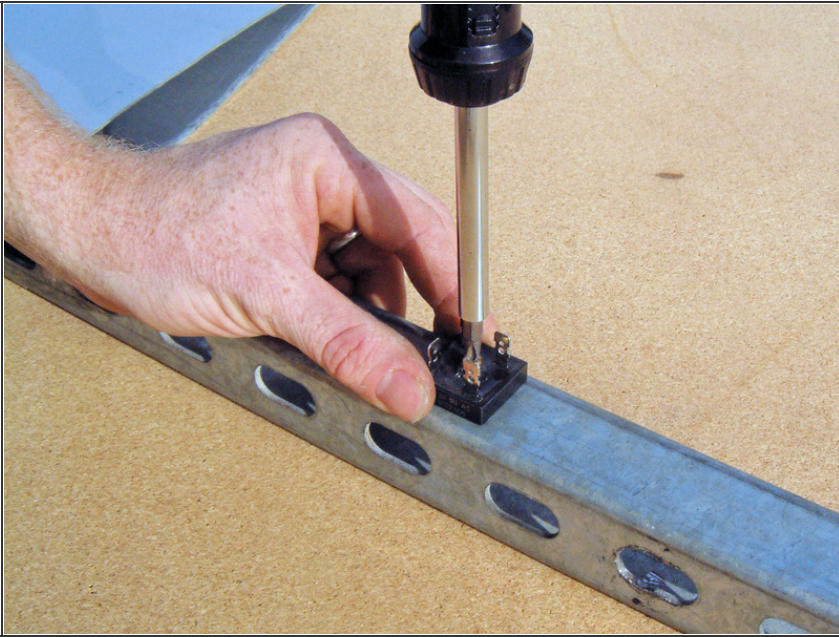
- Label the blades and hub so that you can match which blade goes where.
- Remove the blades, and drill and tap the three outer holes on the hub.

Step 11



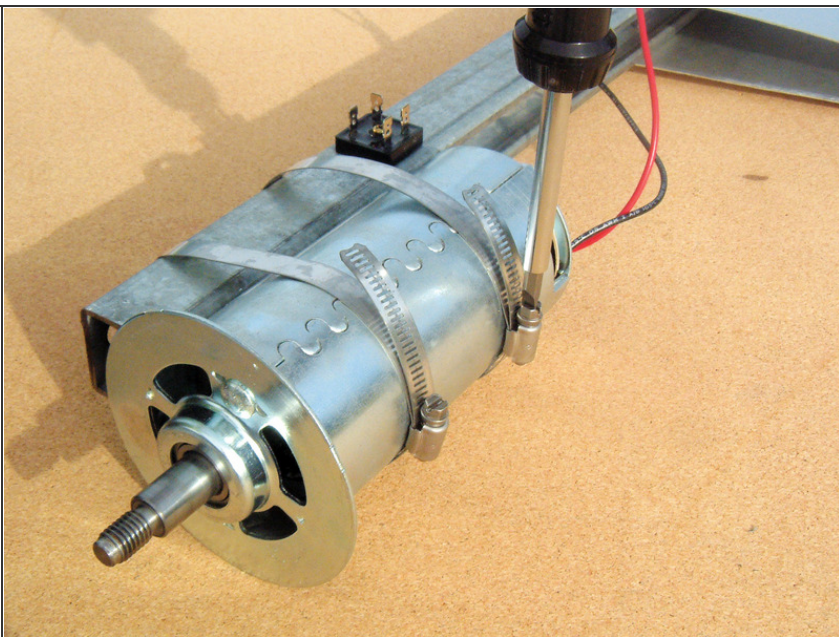
- Position each blade in its place on the hub, so that all the holes line up.
- Using the 1/4" bolts and washers, bolt the blades back onto the hub.
- For the inner three holes, use two washers per bolt, one on each side of the blade. For the outer holes, just use one washer next to the head of the bolt. Tighten.

Step 12 — Assemble the generator.



- Drill a 1/4" hole in the tubing, about 5 inches from the front end of the tube, opposite the tail holes end, on any side.
- Place the bridge rectifier over the hole, and screw it to the tubing using a #10 sheet metal screw.

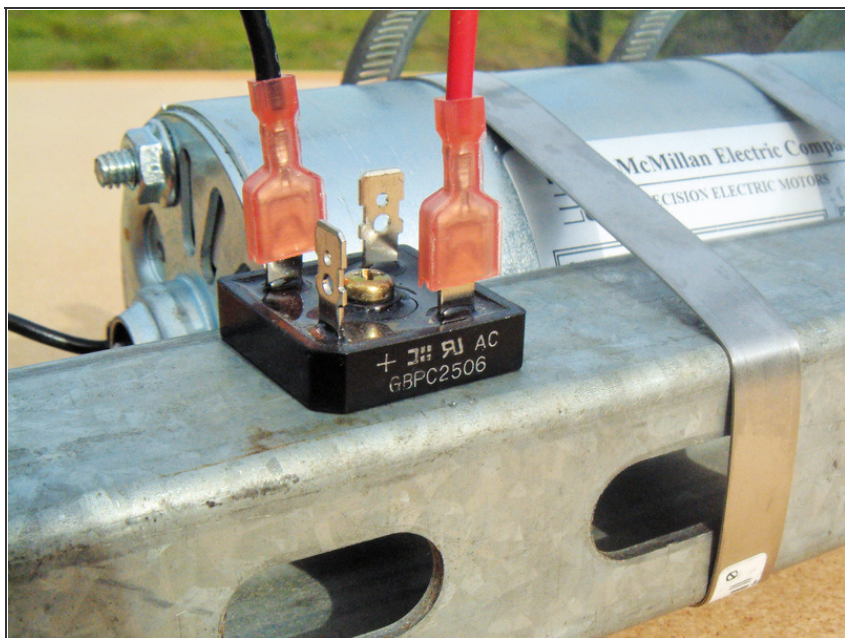
Step 13



- Using hose clamps, mount the motor on the end opposite the tail.
- Do not tighten the clamps, because you will make a balance adjustment later.

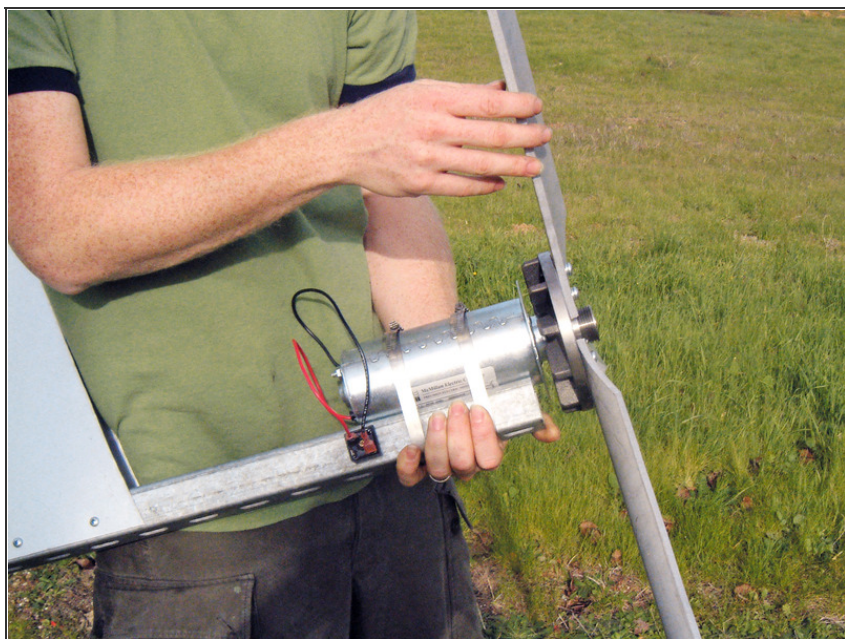


Step 14



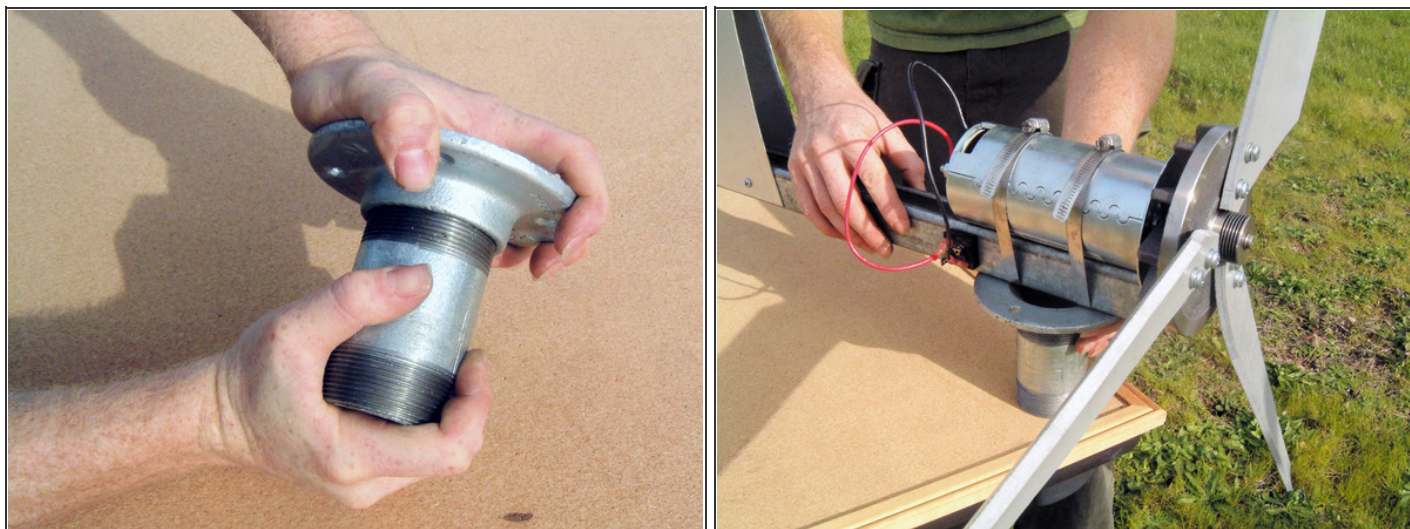
- Crimp spade connectors onto the black and red wires from the motor, and connect them to the two AC voltages in terminals on the bridge rectifier, L1 and L2.
- Insulate connections with heat-shrink tubing or electrical tape.

Step 15



- If you haven't already, attach the tail.
- Re-attach the blade assembly on the motor.


Step 16



- Now we'll attach the tower mount. Using a pipe wrench, screw the nipple tightly into the floor flange.
- Clamp the nipple in a vise so the floor flange faces up and is level.
- Set the generator on the flange/nipple and balance it by adjusting the position of the motor, then tighten the hose clamps down. Mark spots in the square tubing that match up with the flange holes.
- Drill these two holes using a 5/32" drill bit. (You will probably have to take off the hub and tail to do this.)
- Attach the square tubing to the floor flange with two sheet metal screws.


Step 17 — Plant the tower base.



- The tower is one of the most important components in your wind generator system. It must be strong, stable, easily raised and lowered, and well anchored. 
- Dig a round hole about 1 foot in diameter and 2 feet deep.
- Feed the 6" x 1-1/4" steel pipe nipple through the horizontal part of the 1-1/2" steel pipe T.
- Screw the pipe elbows onto each end of the nipple, one on either side of the T, so that they both point in the same direction.
- Screw the two 2' x 1-1/4" pipe nipples into the free ends of the elbows.
- Set this hinged base assembly in the hole, so that the T just clears the ground. Dig around, adjust, and position things so that the 2' nipples point straight down and the horizontal part of the T is perfectly level.
- With the base properly positioned, mix some concrete and pour it into the hole.

Step 18 — Erect and stay the tower.



- NOTE: The higher your tower is, the more wind your generator will catch, and the more power it will produce. 
- Drill a large hole about 1 foot from the bottom of the 10'-30' pipe, for the copper wires to exit.
- Screw the pipe into the vertical part of the base's hinged T.
- Make four strong, flexible rings out of guy wire, about 5 inches in diameter. For each ring, loop the wire around several turns, and twist it closed.
- Place the 1-1/2" U-bolt around the pipe, 3 feet from the top of the pipe. Thread the four wire loops around the U-bolt, and space them evenly around the pipe. Then tighten the nuts of the U-bolt.
- Secure a guy wire to each of the loops on the U-bolt. Also loop the ropes (safety ropes) through loops on opposite sides of the pole.

Step 19



- Position the four stakes, spacing them evenly apart at a distance away from the base that's at least 50% of the tower's height.
 - For our 15-foot-tall pole, we positioned the stakes 12 feet away from the base.
- Then drive the stakes firmly into the ground, slightly angling them away from the base. Or, for greater strength and permanence, dig holes 2 feet into the ground, and set the stakes in concrete.
- Wire a turnbuckle to each stake, using several strands of guy wire.
- Raise the pole up and tie each of the safety ropes to something solid, like a truck or a building (this is where having another person or two really helps). Attach the guy wires to the turnbuckles.
- Hold the pole straight upright, and tighten all turnbuckles to ensure a secure fit.
- Mark the front turnbuckle for future reference, so you know how far you need to screw it back in when you're re-raising the pole.

Step 20 — Wire and mount the generator.



- Release the front guy wire and lower the pole to the ground.
- Feed two lengths of #8 wire, red and black, down through the pole and out through the hole in the bottom of the pipe. Then wrap the bottom ends of the two wires together, to create a closed circuit.
 - This is a safety precaution; it puts a load on the wind generator to prevent it from spinning around fast while you're working on it.
- Slide the generator assembly over the top of the pole.

Step 21



- Pull the pole wires up through the mount, strip the ends, and crimp them into spade connectors.
- Plug the red wire into the DC+ terminal of the spade connector (which will probably be perpendicular to the others), and the black wire into the DC terminal.
- Insulate connections with heat-shrink tubing or electrical tape.

Step 22



- Raise the pole by pulling the front guy wire into place, and tighten the turnbuckle to the mark made earlier.
- Unwrap the ends of the wires and wire up your system as shown in the schematic.
- Connect a regulator, an ammeter, a fuse, and a stop switch on the positive line coming from the generator, between the generator and the battery bank. Refer to the manufacturer's instructions.
- Then hook up the battery bank, and watch it fill up with free power!

This project originally appeared in [MAKE Volume 05](#).

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